This listing of claims will replace all prior versions, listings, of claims in the application:

Listing of Claims:

1. (currently amended) An optical data storage device, comprising:

a nanostructured material having colloidal core particles embedded in at least one shell material with the colloidal core particles forming an array throughout the shell material, the at least one shell material forming a continuous phase in which the colloidal core particles are embedded; and

the colloidal core particles including first light sensitive molecules incorporated therein with an absorption maximum at a first wavelength λ_1, and a region of the at least one shell material in close proximity to each colloidal particle including at least second light sensitive molecules incorporated with an absorption maximum at a second wavelength λ_2 different from the first wavelength.

2. (currently amended) The device according to claim 1 wherein said colloidal core particles form a periodic array throughout the at least one shell material.

3. (currently amended) The device according to claim 2 wherein said colloidal core particles are made of a polymer material, and wherein the shell material is made of a polymer material ~~and forms a continuous phase in which the colloidal core particles are embedded~~.

4. (original) The device according to claim 3 wherein the first and second light sensitive molecules are molecules which fluoresce at wavelengths λ_4 and λ_5 respectively.

5. (original) The device according to claim 4 wherein the first and second light sensitive molecules are covalently bound to the core particles and shell material, respectively.

6. (original) The device according to claim 3 wherein the at least one shell material is an outer shell material which forms the continuous phase in which the colloidal core particles are embedded, including at least one additional shell enveloping each of the colloidal core particles located between the colloidal core particles and the outer shell material, and wherein the at least one additional shell is made of a polymer material.

7. (original) The device according to claim 6 wherein the at least one additional shell enveloping each of the colloidal core particles includes third light sensitive molecules incorporated therein.

8. (original) The device according to claim 7 wherein the first, second and third light sensitive molecules are fluorescent molecules which absorb at wavelengths λ_1 , λ_2 and λ_3 respectively, and fluoresce at λ_4, λ_5, λ_6 respectively.

9. (original) The device according to claim 8 wherein the first, second and third light

sensitive molecules are covalently bound in the colloidal core particles, in the outer shell material and in the at least one additional shell respectively.

10. (original) The device according to claim 3 wherein the at least one shell material is an outer shell material which forms the continuous phase in which the colloidal core particles are embedded, including a plurality of additional shells located between the colloidal core particles and the outer shell material, and wherein the plurality of additional shells are made of a polymer material.

11. (original) The device according to claim 10 wherein the plurality of additional shells enveloping colloidal core particles includes a first shell adjacent to the colloidal core particles and a second shell adjacent to the first shell, and wherein the first shell adjacent to the colloidal core particles and alternating shells do not contain light sensitive molecules for substantially preventing nonradiative energy transfer and/or crosstalk in interfacial regions between the colloidal core particles and the shells and between adjacent shells.

12. (original) The device according to claim 2 wherein the first and at least second light sensitive molecules are molecules which fluoresce.

13. (original) The device according to claim 12 wherein the molecules which fluoresce are dye molecules which absorb light and fluoresce at different pre-selected wavelengths.

14. (original) The device according to claim 1 wherein the nanostructured material is a two dimensional material in which the colloidal core particles form a periodic two-dimensional array in the at least one shell material.

15. (original) The device according to claim 1 wherein the nanostructured material is a three-dimensional material in which the colloidal core particles form a periodic three-dimensional array in the at least one shell material.

16. (original) The device according to claim 1 wherein the nanostructured material is applied to a document, and wherein information is written into the nanostructured material by altering a property of the one of first light sensitive molecules and the at least second light sensitive molecules, or a combination of both, using light.

17. (original) The device according to claim 4 wherein the nanostructured material is applied to a document, and wherein information is written into the nanostructured material by a step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules.

18. (original) The device according to claim 17 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules includes storing a first type of information by photobleaching the first light sensitive molecules in a pre-selected region of the

nanostructured material using a light source which emits light at an effective wavelength to photobleach the first light sensitive molecules but not the at least second light sensitive molecules.

19. (original) The device according to claim 18 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules further includes storing a second type of information by photobleaching at least one of the at least second light sensitive molecules in the pre-selected region of the nanostructured material using a light source which emits light at an effective wavelength for photobleaching the at least one of the at least second light sensitive molecules but not the first light sensitive molecules and a remaining number of the at least second light sensitive molecules for storing multiple types of information in the same region of the nanostructured material.

20. (original) The device according to claim 4 wherein the nanostructured material is a computer memory storage device, and wherein information is written into the nanostructured material by a step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules are molecules which fluoresce.

21. (original) The device according to claim 20 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules includes storing a first type of information by photobleaching the first light sensitive molecules in a pre-selected region of the

nanostructured material using a light source which emits light at an effective wavelength to photobleaching the first light sensitive molecules but not the at least second light sensitive molecules.

22. (original) The device according to claim 21 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules further includes storing a second type of information by photobleaching at least one of the at least second light sensitive molecules in the pre-selected region of the nanostructured material using a light source which emits light at an effective wavelength for photobleaching the at least one of the at least second light sensitive molecules but not the first light sensitive molecules and a remaining number of the at least second light sensitive molecules for storing multiple types of information in the same region of the nanostructured material.

23. (original) The device according to claim 21 wherein the nanostructured material is a two dimensional material in which the colloidal core particles form a periodic two-dimensional array in the at least one shell material.

24. (original) The device according to claim 21 wherein the nanostructured material is a three-dimensional material in which the colloidal core particles form a periodic three dimensional array in the at least one shell material.

25. (original) The device according to claim 24 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material includes using single-photon or two-photon photobleaching.

26. (original) The device according to claim 25 wherein the single-photon or two-photon photobleaching is done using a confocal microscope for writing in the information at a pre-selected depth in the three dimensional array.

27. (original) The device according to claim 23 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material includes using single-photon or two-photon photobleaching.

28. (original) The device according to claim 3 wherein the at least one shell material is a plurality of shells, wherein each of the plurality of shells includes light sensitive molecules, with the light sensitive molecules in a given shell being light sensitive at a wavelength different from the wavelength of the light sensitive molecules in the rest of the shells.

29. (original) The device according to claim 3 wherein the at least one shell material is a plurality of shells, wherein the plurality of shells is an even number of shells, wherein the shell immediately adjacent to each colloidal core particle is a first shell and the next shell immediately adjacent to the first shell is a second shell, and wherein only alternating shells of the plurality of shells contain light sensitive molecules starting with

the second shell, with the light sensitive molecules in a given shell being light sensitive at a wavelength different from the wavelength of the light sensitive molecules in the rest of the alternating shells.

30. (original) The device according to claim 28 wherein the nanostructured material is a two-dimensional material in which the colloidal core particles form a periodic two-dimensional array.

31. (original) The device according to claim 28 wherein the nanostructured material is a three-dimensional material in which the colloidal core particles form a periodic three-dimensional array.

32. (original) The device according to claim 31 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material includes using single-photon or two-photon photobleaching.

33. (original) The device according to claim 32 wherein the single-photon or two-photon photobleaching is done using a confocal microscope for writing in the information at a pre-selected depth in the three dimensional array.

34. (original) The device according to claim 30 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material includes using single-photon or two-photon photobleaching.

35. (original) A method of producing an optical data storage device, comprising the steps of:

incorporating first light sensitive molecules into colloidal core particles;

incorporating second light sensitive molecules into at least one shell forming material;

encapsulating the colloidal core particles in the at least one shell forming material; and

producing a periodic array of the encapsulated colloidal core particles, and processing the periodic array in such a way that the at least one shell forming material forms a continuous phase in which the colloidal core particles are encapsulated.

36. (original) The method according to claim 35 wherein the colloidal core particles are made of a polymeric material having a glass transition temperature $T_{g,\,CFP}$, and wherein the at least one shell forming material is made of a polymeric material having a glass transition temperature $T_{g,\,SFP}$, wherein $T_{g,\,SFP} < T_{g,\,CFP}$, and wherein the step of processing the periodic three dimensional assembly in such a way that the at least one shell forming material forms a continuous phase includes heating the periodic three dimensional assembly up to the glass transition temperature $T_{g,\,SFP}$.

37. (original) The method according to claim 36 wherein the first and second light sensitive molecules are molecules which fluoresce with maximum absorption at different

wavelengths λ_1 and λ_2 respectively, and which fluoresce at different wavelengths at λ_4 and λ_5 respectively.

38. (original) The method according to claim 37 wherein the first and second light sensitive molecules are covalently bound in the colloidal core particles and the at least one shell material respectively.

39. (original) The method according to claim 38 wherein the at least one shell forming material is two or more shell forming materials made of polymeric materials each having a glass transition temperature, the two or more shell forming materials enveloping the colloidal core particles form concentric shells, wherein one of the two or more shell forming materials is adjacent to each colloidal core particle and another of the two or more shell forming materials forms an outer shell, and wherein the shell forming material forming the outer shell has a glass transition temperature $T_{g,outer\ SFP}$ lower than the glass transition temperatures of all other shells located between it and the colloidal core particle, and wherein the outer shell has the second light sensitive molecules incorporated therein, and each of the remaining shells have light sensitive molecules incorporated therein which are sensitive at a different wavelength than the light sensitive molecules in the colloidal core particle and all the other shells.

40. (original) The method according to claim 38 wherein the at least one shell forming material is two or more shell forming materials made of polymeric materials each having a glass transition temperature, the two or more shell forming materials

enveloping the colloidal core particles to form concentric shells, wherein one of the shells is adjacent to the colloidal core particle and another of the two or more shell forming materials forms an outer shell, and wherein the shell forming material forming the outer shell has a glass transition temperature $T_{g,outer\ SFP}$ lower than the glass transition temperatures of all other shells located between it and the colloidal core particle, and wherein the shell adjacent to the colloidal core particle does not have light sensitive molecules located therein, and wherein light sensitive molecules are located in alternating shells for substantially preventing nonradiative energy transfer and/or crosstalk in interfacial regions between the colloidal core particles and the shells and between adjacent shells.

41. (original) The method according to claim 36 wherein the at least one shell forming material is two shell forming materials to give two shells each containing light sensitive molecules which absorb at different wavelengths, wherein the first light sensitive molecules in the colloidal core particles are molecules with maximum absorption at wavelength λ_1 and which fluoresce at wavelength λ_4, wherein the second light sensitive molecules located in one of the two shells absorb at wavelength λ_2 and fluoresce at wavelength λ_5, and including third light sensitive molecules located in the third shell with maximum absorption at wavelength λ_3 and fluoresce at wavelength λ_6.

42. (original) The method according to claim 41 wherein the first, second and third light sensitive molecules are covalently bound in the colloidal core particles and the two shells respectively.

43. (original) The method according to claim 35 wherein the nanostructured material is a two-dimensional material in which the colloidal core particles form a periodic two-dimensional array in the at least one shell material.

44. (original) The method according to claim 35 wherein the nanostructured material is a three-dimensional material in which the colloidal core particles form a periodic three-dimensional array in the at least one shell material.

45. (currently amended) A method of storing information in an optical data storage device comprised of nanostructured polymer-based material comprised of an array of colloidal core-shell particles with colloidal cores containing one dye and at least one shell around each colloidal core containing at least a second dye, the at least one shell forms a continuous phase in which the colloidal core particles are embedded, the method including the steps of

selective photon photobleaching of at least one of the two dyes in a pre-selected region of the array.

46. (original) The method according to claim 45 wherein the selective photon photobleaching is single photon photobleaching of the at least one of the two dyes in the pre-selected region of the array.

47. (original) The method according to claim 45 wherein the selective photon photobleaching is two-photon photobleaching of the at least one of the two dyes in the pre-selected region of the array.

48. (original) The method according to claim 46 wherein the nanostructured material is a two-dimensional material in which the colloidal core particles form a periodic two-dimensional array.

49. (original) The method according to claim 46 wherein the nanostructured material is a three-dimensional material in which the colloidal core particles form a periodic three-dimensional array.

50. (original) The method according to claim 49 wherein the step of selectively photobleaching pre-selected region of the nanostructured material includes using single-photon or two-photon photobleaching.

51. (original) The method according to claim 50 wherein the single-photon or two-photon photobleaching is done using a confocal microscope for writing in the information at a pre-selected depth in the three-dimensional array.

52. (original) The method according to claim 48 wherein the step of selectively photobleaching pre-selected region of the nanostructured material includes using single-photon or two-photon photobleaching.

53. (original) The method according to claim 45 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules includes storing a first type of information by photobleaching the first light sensitive molecules in a pre-selected region of the nanostructured material using a light source which emits light at an effective wavelength to photobleaching the first light sensitive molecules but not the at least second light sensitive molecules.

54. (original) The method according to claim 53 wherein the step of selectively photobleaching pre-selected regions of the nanostructured material containing the first and at least second light sensitive molecules includes storing at least a second type of information by photobleaching at least one of the at least second light sensitive molecules in the pre-selected region of the nanostructured material using a light source which emits light at an effective wavelength for photobleaching the at least one of the at least second light sensitive molecules but not the first light sensitive molecules and a remaining number of the at least second light sensitive molecules for storing multiple types of information in the same region of the nanostructured material.